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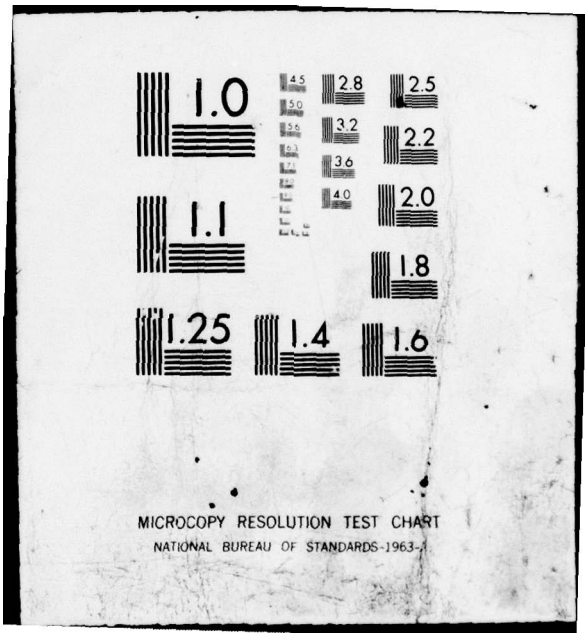
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by

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ABSTRACT

These abstracts provide a synopsis of research projects conducted by dental officers enrolled in the first-, second-, and third-year residency programs at the National Naval Dental Center, Bethesda, Maryland, during the academic year 1978-1979. The projects were completed in partial fulfillment of the requirements of the programs.

The opinions and assertions contained in these abstracts are the private ones of the writers and are not to be construed as official or as reflecting the views of the Department of the Navy.

Studies involving human subjects were conducted with the approval of the Committee for the Protection of Human Subjects.

The experiments reported herein were conducted according to the principles set forth in the Guide for the care and use of laboratory animals, Institute Of Laboratory Resources, National Research Council, DHEW, Pub. no. (NIH) 74-23.

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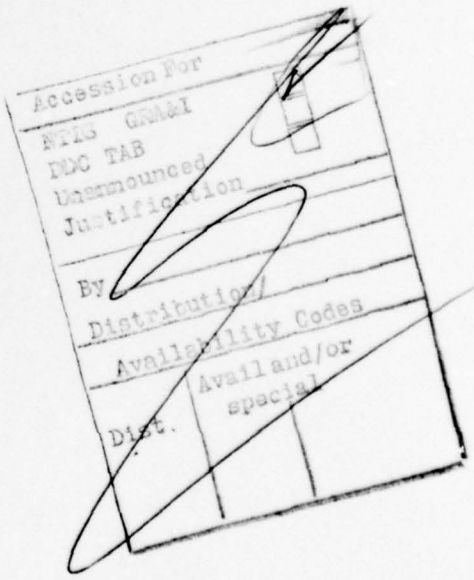

No. 1

AMALGAM REPAIR OF CAST GOLD CROWN MARGINS: A MICROLEAKAGE STUDY

D. R. Fitch and W. J. Boyd, Jr.

Recurrent caries at the margin of a cast gold crown is a frequent clinical problem. The most common treatment for this problem has been to remove the caries and place an amalgam restoration. There is much controversy, however, about the effect of placing gold and amalgam in contact with each other in the mouth because of the potential for a high and continuous corrosion rate that could result in subsequent failure of the amalgam restoration. The purpose of this study was to evaluate microleakage of the cast gold-dental amalgam interface at various times after amalgam placement. A total of 30 extracted human teeth were used in this study. Full crown preparations were cut, and crowns were cast and cemented on the teeth. Buccal or lingual Class V cavity preparations were cut in all teeth, extending from untouched enamel into and undermining the crown margin. Amalgam was placed in the preparations in direct contact with the gold. The teeth were thermocycled and then stored in a saline solution. At intervals of 1 week, 1 month, and 2 months, 10 teeth were removed from the saline solution and prepared for microleakage evaluation using a ^{45}Ca radioisotope solution. The teeth were sectioned through the amalgam restorations, and autoradiographs were made to evaluate microleakage at the gold-tooth (control), the amalgam-tooth, and the amalgam-gold interfaces. No leakage was found at the amalgam-gold interface at any of the time periods. The results strongly suggest that the repair of cast gold crown margins with amalgam restorations is a sound clinical procedure.

No. 2

COMPARISON OF CORTICAL AND CANCELLOUS FREEZE-DRIED BONE ALLOGRAFTS, BOTH UNDECALCIFIED AND DECALCIFIED, AS INDUCTIVE SUBSTRATES FOR OSTEOGENESIS

J. E. Trapp

Many graft materials have been utilized in osseous defects, and a great deal of research is currently being done to determine which materials or combination of materials has the greatest osteogenic inductive properties. This investigation was undertaken to compare cortical and cancellous freeze-dried bone allografts, both undecalcified and decalcified, as inductive substrates for osteogenesis. Allogenic bone was prepared according to the method of Urist. Half of the bone used in the study was decalcified and the other half remained undecalcified. Nylon mesh chambers were utilized to implant the graft materials into defects created in the calvarias of 35 guinea pigs. The animals were sacrificed at 3, 7, 14, 21, 28, 35, and 42 days. Five animals were sacrificed at each time period. Strontium-85, injected intraperitoneally 3 days prior

to sacrifice, provided a means of quantifying rates of bone growth for the four graft materials. Histological evaluation will be done next year to assess new bone formation. Scintillation counts have been determined for all animals. Although statistical analysis cannot be made at this time because of the limited amount of data available, some trends were observed. Most notably, between day 14 and day 28, the rate of bone growth for decalcified cortical freeze-dried bone appeared to exceed the rates of the other three materials. This suggests that the decalcified cortical freeze-dried bone allograft may be superior in its osteogenic inductive potential when compared to the other materials tested. The findings also appear to confirm the findings of other studies, that there is no difference in osteogenic potential between cortical and cancellous undecalcified freeze-dried bone allografts.

No. 3

DECONTAMINATION OF DENTAL HIGH-SPEED HANDPIECES

R. L. Jucovics and V. M. Lynch

Since most conventional methods of sterilizing high-speed handpieces are either damaging or time consuming, dentists usually rely on wiping techniques to decontaminate handpieces between patients. However, the effectiveness of wiping procedures is questionable. The purpose of this study was to evaluate the effectiveness of 2% alkalinized glutaraldehyde (a sterilizing agent) and 70% isopropyl alcohol wipes for decontaminating dental high-speed handpieces. Dental high-speed Midwest Quiet-Air handpieces were artificially contaminated with about 3 million Bacillus subtilis spores diluted in a 50% bovine serum solution. The contaminated handpieces were then separately wiped for 30 seconds with a gauze sponge saturated with either 2% alkalinized glutaraldehyde, 70% isopropyl alcohol, or physiological saline solution (control). After wiping, the handpieces were either wrapped with their respective wipe or left unwrapped for 15 minutes. Assays were then made to determine the number of recoverable colony-forming units. The effectiveness of a wiping technique was determined as the percent reduction from the number of spores recovered from the artificially contaminated handpiece before employing a wiping procedure. Glutaraldehyde wipes showed a 99.99% reduction in the level of contamination. This was significant when compared with the saline control, which had a 99.5% reduction for the wrapped handpieces. On the other hand, the saline wipes proved to be significantly more effective than the alcohol wipes. Although there was no significant difference between reductions found for wrapped and unwrapped handpieces treated with glutaraldehyde, percent reductions for saline and alcohol wipes were significantly greater for the unwrapped handpieces. This comparison of wiping techniques for decontaminating dental high-speed handpieces indicates that the greatest effectiveness can be achieved with the 2% alkalinized glutaraldehyde solution.

No. 4

THE EFFECT OF CAVITY VARNISH ON THE SEALING PROPERTIES OF HIGH-COPPER AMALGAM ALLOYS

C. C. Lamb and C. F. Massler, Jr.

When compared with conventional amalgam alloys, the new high-copper amalgam alloys exhibit greater compressive strength and improved marginal integrity. However, the high-copper alloys are virtually free of the corrosive gamma$_2$ phase when set. A reduction in corrosion may increase the importance of using cavity varnish beneath these alloys as a barrier against microleakage. This study was undertaken to examine the effect of cavity varnish on the sealing properties of four high-copper amalgam alloys: Phasealloy, Dispersalloy, Tytin, and Sybraloy. Caulk Spherical Alloy was used as a control. Restorations were placed in Class V lingual and buccal cavity preparations in 120 sound, extracted human premolars. Half of the preparations were treated with two layers of cavity varnish prior to restoration, while the other half were not. The restorations were examined for microleakage 1 week, 1 month, 3 months, and 6 months after placement using the autoradiographic technique described by Phillips et al. The radioisotope used was ^{45}Ca. Autoradiographs were evaluated using Going's system as modified by Larson and Moyer. Phasealloy showed significantly less leakage, with and without cavity varnish, at 6 months than at any earlier time period. Dispersalloy showed a significant decrease in leakage between 3 and 6 months with use of cavity varnish. Phasealloy and Dispersalloy were the only admixture type alloys used in this study, which suggests that the method of copper addition may affect the marginal seal of the alloy. Comparisons between the Caulk Spherical Alloy control and the experimental alloys showed no significant differences at any of the times, regardless of whether cavity varnish was used. Since 45 of our triturators were found to be miscalibrated, we believe the ineffectiveness of cavity varnish with both control and experimental alloys may be due to overtrituration. Excessive setting shrinkage resulting from overtrituration may negate the effectiveness of the cavity varnish seal.

No. 5

THE EFFECT OF CHLOROFORM ON THE APICAL SEAL OF TEETH OBTURATED WITH GUTTA-PERCHA AND A ROOT CANAL CEMENT SEALER

J. J. Boyd, Jr.

One of the primary objectives of endodontic treatment is the obliteration of the root canal space in three dimensions. Many different types of filling materials have been used in order to achieve this objective. Several methods involve the use of chloroform with gutta-percha. The purpose of this study is to examine the effect of chloroform on the apical seal of teeth obturated with gutta-percha and a zinc oxide-eugenol

type cement. Extracted human teeth were obturated using one of three methods: (1) gutta-percha dipped in chloroform with no sealer used, (2) gutta-percha dipped in chloroform and placed into a canal with a zinc oxide-eugenol type sealer, and (3) gutta-percha and the sealer used without the chloroform. Methylene blue dye was used to determine sealability, and the length of dye penetration along the dentin/gutta-percha interface was statistically compared for each method. Teeth obturated with gutta-percha dipped in chloroform showed significantly greater dye penetration than teeth obturated without the use of chloroform. Chloroform had a deleterious effect on the apical seal achieved with gutta-percha, with and without the zinc oxide-eugenol type sealer. These preliminary findings indicate that chloroform should not be used for the obturation methods tested. This does not preclude the use of chloroform in other obturation techniques. The study is continuing in an effort to validate the findings with a greater number of samples.

No. 6

THE EFFECT OF INTRACANAL MEDICAMENTS ON THE SEALING ABILITY OF CAVIT

B. S. Antioquia and G. R. Myers

The purpose of this study was to examine the effects of formocresol, metacresylacetate (Cresatin), camphorated parachlorophenol (CMCP), and 2% liquified parachlorophenol on the microleakage of a temporary sealing material (Cavit). One hundred extracted human maxillary and mandibular third molars were prepared with a flared occlusal endodontic access and divided equally for treatment among the four medicaments and a saline solution (control). They were then sealed with 3.5 mm of Cavit. Half of the teeth were tested 4 days and the other half were tested 28 days after treatment. Of the 10 teeth tested for each medicament at a time period, 5 were thermocycled and the other 5 were not. After the testing periods, the teeth were prepared for autoradiographic evaluation using a ^{45}Ca radioisotope solution. The teeth were then sectioned occluso-apically through the middle of the Cavit restoration and evaluated for isotope penetration. A designation for penetration was made if the isotope solution had gone through the entire 3.5 mm of Cavit. All medicaments showed leakage after 4 and 28 days. When the data for the thermocycled and nonthermocycled teeth were combined for statistical analysis and the medicaments compared to the saline control solution, the results were not significant for formocresol and liquified parachlorophenol. The results showed borderline significance for Cresatin and CMCP at the 4-day test period. Further study is indicated with Cresatin and CMCP at shorter time periods and with a larger number of samples.

No. 7

THE EFFECT OF VARYING LIGHT INTENSITIES ON COLOR PERCEPTION WITHIN THE DENTAL RANGE

G. J. Barna and J. W. Taylor

One of several variables that influences the correct matching of tooth color is the intensity of light emitted from the office source. The purpose of this study was to evaluate the influence of light intensity on the dentist's ability to discriminate color differences within the dental range. Tests were conducted in a 156-cubic-foot room painted a neutral gray, with a Munsell value of 8. Lighting was provided by two four-bulb fluorescent fixtures using Verd-A-Ray CritiColor color-corrected tubes with polarizing diffusers. The bulbs were adjusted to provide levels of intensity of 300, 225, 150, and 75 footcandles at the testing surface. The test materials consisted of two identical sets of 25 color chips which had a range in hue of 0.7 yellow to 2.9 yellow and a chroma range of 2.85 to 3.6. At each light intensity, participants were asked to match five randomly selected color chips from one set with the identical chips from the other set. Thirty-five resident dental officers, five of whom were found to be color defective, participated in the study. The age, specialty, and years in dental practice were recorded for each participant. The results indicated that color discrimination did not differ significantly between footcandle levels of 300, 225, 150, and 75. Nor did a participant's age, specialty, or years in practice have any effect on color discrimination. It was also found that color-defective individuals cannot be expected to match tooth shades adequately. Those dentists who are color defective should obtain assistance when matching tooth shades. Future investigation will focus on increasing the number of samples and studying in more depth the relation between experience in color matching and accuracy in selecting tooth shades.

No. 8

THE EFFECTS OF WATER-SOLUBLE BIOFLAVONOID ASCORBIC ACID COMPLEX ON CAPILLARY PERMEABILITY AND FRAGILITY

W. A. Rathbun, Jr.

Abnormal capillary permeability and fragility may produce petechiae, purpura, eccymoses, prolonged bleeding following surgical procedures, exacerbated inflammatory reactions, and other localized and constitutional signs. Many studies have reported the beneficial results of treatment with a bioflavonoid-ascorbic acid complex on certain diseases associated with capillary fragility. This study examines the direct effect of bioflavonoid-ascorbic acid therapy on capillary fragility in humans. An instrument called a petechiometer was used to produce capillary fragility and subsequent petechiae by means of a negative pressure applied to the skin. Nine subjects were tested, and the number of petechiae were counted weekly for 1 month prior to treatment with bioflavonoid-ascorbic acid

complex, for 1 month during treatment, and for 1 month post-treatment. Using the pretreatment period as the control, comparisons were made between the number of petechiae at pretreatment and treatment phases, and between the number of petechiae at pretreatment and post-treatment phases. The preliminary results indicated that there was a decreased number of petechiae during and after treatment with the bioflavonoid-ascorbic acid complex. This reduction in the number of petechiae was significant when the mean petechiae counts for all nine subjects were combined and statistically compared. However, when comparisons were made separately for each subject, no significant reductions were found. A finding of no significance might have resulted from the fact that too few tests were done. Therefore, in the second part of this study, the number of tests for each subject will be increased.

No. 9
EVALUATION OF DECALCIFIED FREEZE-DRIED BONE ALLOGRAFTS IN PERIODONTAL OSSEOUS DEFECTS

G. Quintero

It is generally accepted that the most effective graft material in periodontal therapy is fresh autogenous bone, but this material has limitations. Since the literature supports the potential use of decalcified freeze-dried bone in periodontal therapy, its evaluation on an extended basis is warranted. The purpose of this study was to determine the predictability of success when using decalcified freeze-dried bone allografts in reconstructing periodontal osseous defects. Human cortical bone was supplied by the Naval Tissue Bank. It was obtained from a donor's femur within 24 hours after death and was immediately frozen to -197° C and freeze-dried following the established protocol of the Naval Tissue Bank. The decalcification procedures followed a modification of the technique devised by Urist, and the graft material was ground to a particulate size of 250-450 microns and stored in 1/2-ounce sterile glass bottles subjected to a secondary vacuum. Ten periodontists were asked to evaluate the regenerative efficacy of the decalcified freeze-dried bone allografts using fabricated stents and calibrated periodontal probes. A total of 100 grafted defects were evaluated. Measurements were made from the base of the stent to the cementoenamel junction, the free gingival margin, the base of the pocket, the alveolar crest, and the base of the osseous defect. Clinical data were supported with pregrafting and postgrafting radiographs and photographs. Currently, none of the completed surgeries has reached the 6-month re-evaluation date. But in all of the patients, 1-week postgrafting radiographs have provided evidence that the graft material was retained at the defect site, thus allowing the speculation that the graft material will indeed allow osseous regeneration in periodontal osseous defects.

No. 10

EVALUATION OF 1 PERCENT 5-FLUOROURACIL IN THE TREATMENT OF ACTINIC KERATOSIS OF THE LIP

G. R. Warnock

The treatment of actinic keratosis of the skin with 5-fluorouracil has proved to be an effective and convenient treatment modality. Recently, topically applied 5-fluorouracil has gained acceptance in the therapy for actinic keratosis of the lip. However, no investigation has used pre- and post-treatment biopsies to determine the histological effectiveness of this treatment. The purpose of this investigation was to determine the histological effectiveness of 5-fluorouracil in the treatment of actinic keratosis of the lip. Patients included in the study displayed the clinical stigmata of actinic keratosis, and preliminary biopsies were done to histologically confirm the diagnoses. Treatment with topically applied 5-fluorouracil was completed over a 2- to 3-week period. After post-treatment healing, biopsies were done at the site immediately adjacent to the original biopsy site. Histopathologic evaluation was done comparing the pre- and post-treatment biopsies, as well as clinical assessment for dissolution of the clinical stigmata. The treatment consistently produced positive effects, eliminating the clinical characteristics of actinic keratosis. Histologic evaluation, however, showed the histopathologic features of actinic keratosis, with dysplastic changes seen in all post-treatment biopsies. The degree of dysplasia, however, was less severe in all post-treatment biopsies, with the exception of one case in which moderate dysplasia persisted after 5-fluorouracil therapy. The results of this investigation indicate that, even though good clinical results were obtained, histologic evaluation proved that the actinic lesions were still present, with varying degrees of dysplasia and potential for malignant change.

No. 11

AN EVALUATION OF SURFACE QUALITIES OF PRECIOUS AND NONPRECIOUS METALS AND THEIR RELATION TO BONDED PORCELAIN STRUCTURE

E. M. Fraleigh and J. E. Morley

One of the most frustrating types of failure in the construction of a ceramometal restoration is a fracture of the porcelain portion of the restoration. One possible cause may be in the metal surface preparation prior to application of the porcelain. The purpose of this study was to determine the effect of smooth and rough surface preparations on the bonding characteristics of ceramometal restorations. Ceramometal test tabs with three different surface preparations obtained by metallurgical polish, a Paasche Air Eraser, and a fine-cut abrasive wheel were evaluated for their effect on porcelain. Each surface had 3.0 mm of Biobond porcelain applied, which was subsequently removed in 0.5 mm increments

through optical polishing, using a technique advocated by the Optical Polishing Division of the National Bureau of Standards. This technique is known not to induce cracks or craze lines. At each incremental step, the porcelain was evaluated by photomicroscopy. Preliminary results indicated varying degrees of porosity in the samples, which could not at this time be related to the metal surface preparation. The first part of the study has been completed and has established modifications of the experimental procedure both in the initial test tab design and in the standardization of the porcelain application. These modifications will be used in the expanded study that is currently in progress.

No. 12
GALVANISM AND THE NEW HIGH-COPPER AMALGAMS

P. L. Auclair and T. F. Starck

Although the addition of copper to dental amalgam improves many of the amalgam's physical and clinical properties, the increased copper content may raise the amalgam's electromotive potential and subsequently produce detrimental galvanic effects in the patient, including occasional postoperative pain. The electromotive potential of five commercially available amalgams was determined in this study at various time intervals before and after polishing. Three of the amalgams tested contained more than 5% copper: Dispersalloy (12%), Cupralloy (23%), and Sybraloy (29%). Two amalgams, Velvalloy and Optaloy, contained less than 5% copper. Amalgam samples were prepared with platinum wire leads and tested for voltage using a millivoltmeter and a standard calomel electrode. The results ranged from 440 millivolts for Sybraloy to 960 millivolts for Velvalloy. Only Sybraloy, a single-phase high-copper amalgam, had a significantly lower electromotive potential than the Optaloy (control) at all test periods except one. Sybraloy's low potential remained relatively constant throughout the other test periods. Our results indicate that special consideration should be given to the type of amalgam used when placing a new amalgam adjacent to or opposite a restoration with a radically different electromotive potential. To assist the clinician in the selection of the proper restorative material, it is suggested that the brand name of the amalgam be entered on the patient's treatment record.

No. 13
A HISTOLOGIC EVALUATION OF AN EXPEDIENT PULPOTOMY TECHNIQUE USING EUGENOL AND CRESATIN

R. M. Stevens and T. J. Boyer

Pulpotomies in mature permanent teeth are usually limited to emergency procedures and could be termed "expedient pulpotomies." Although the use of eugenol and Cresatin in the pulpotomy technique can be clinically successful, very little research has been done on the histologic

effect of these drugs on the pulp and the periapical tissues. The purpose of this study was to evaluate histologically the expedient pulpotomy technique using eugenol and Cresatin dressings in pulpotomized mature monkey teeth. Seventy-two teeth of three adult Macaca mulatta monkeys received pulpotomies. The monkeys received pulpotomies 6 months, 6 days, and 3 days prior to being sacrificed. Twenty-four teeth were treated at each time period. Cresatin, eugenol, and saline solution (control) were used as medicaments in one-third of the teeth operated on at each time period. The pulpotomies were performed in an aseptic field. Pulps in vital, noncarious teeth were amputated with burs, and bleeding was controlled with cotton pellets. Medicated, dried, cotton pellets were placed over the pulp stumps, and the teeth were sealed with IRM bases, copalite, and occlusal amalgams. At this time, pulpotomies have been completed on two of the monkeys. After the animals were sacrificed with formalin perfusion, their jaws were sectioned and fixed in formalin. Then the teeth were block sectioned. The sections will be decalcified in EDTA for 6 months. These sections will be prepared histologically and stained using H & E and Brown and Brenn stains. A completed report will be submitted next year.

No. 14

MICROLEAKAGE AT THE CAST GOLD ALLOY-DENTAL AMALGAM INTERFACE

R. F. Sobie and G. W. Freeman

When teeth are rebuilt with cast crown restorations, it is questionable whether margins should be terminated on the sound tooth structure or on an amalgam surface. In order to resolve this problem, a study was undertaken to determine the difference in microleakage between the gold-tooth and the gold-amalgam interfaces on teeth restored with full coverage cast crowns. Crowns were placed on 20 extracted noncarious human posterior teeth. After the teeth were soaked for either 30 or 60 days, they were thermocycled 500 times at 30-second intervals between 4° and 37° C. The teeth were then sealed with clear nail polish and sticky wax, soaked in ^{45}Ca radioisotope solution for 2 hours, cleansed, and sectioned. The tooth sections were secured to acrylic plates and exposed to dental X-ray film for 17 hours. Radiographs were evaluated for evidence of microleakage. Statistical comparisons between the gold-tooth (control) and the gold-amalgam (experimental) interfaces showed no significant differences in microleakage for the 30- or 60-day groups. Consequently, the dentist could cut more ideal crown preparations ending on amalgam, thereby conserving tooth structure. Fewer endodontic problems or periodontal complications would result from subgingival crown margins. Further study is suggested in this area for the amalgam-cementum and the gold-cementum interfaces.

No. 15

PULPAL RESPONSE TO CITRIC ACID APPLIED TO THE RADICULAR SURFACE

D. E. Mitchell

Several investigators and clinicians apply citric acid to the radicular dentin surfaces for the repair of a disease-damaged periodontium, but few studies have been undertaken on the pulpal response to citric acid. This investigation will evaluate long- and short-term effects of citric acid on the dental pulps of Rhesus monkeys when applied to surgically exposed radicular dentin. Two adult Rhesus monkeys had the facial aspects of the maxillary and mandibular central and lateral incisors and premolar roots surgically prepared to provide 5- to 6-month specimens, 12- to 16-day specimens, and 1- to 3-day specimens. Two surgical procedures were performed. In an experimental procedure, bone and cementum were removed from the facial radicular surfaces and then citric acid was applied, as suggested by Register and Burdick. In a surgical control procedure, facial radicular surfaces were similarly prepared, but no acid was applied. At this time, the 6-month specimens have been prepared. After the other specimens are prepared, the animals will be sacrificed. Their maxillae and mandibles will be resected, fixed in formalin, demineralized in 20% formic acid, and sectioned for histological evaluation. Evaluation will be for pulpal odontoblastic displacement, inflammation, abscess formation, hemorrhage, and bacterial infection. Also, the formation of reparative dentin, cementum, bone, and a functional periodontal ligament will be evaluated.

No. 16

THE SURFACE HARDNESS AND TEXTURE OF DIVESTMENT USED WITH REVERSIBLE HYDROCOLLOID

J. D. Schroeder and R. B. Linville

Divestment is an accurate gypsum refractory material that can be used as a die material and as an investment material for dental castings. The accuracy of reversible hydrocolloid impression materials has been well documented. It would seem reasonable to assume that a more consistently accurate die would result if the Divestment technique could be used with these materials. However, such a use has been discouraged because of the suspected deficiencies in the surface qualities of the resulting dies. The purpose of this study was to determine whether Divestment, used with reversible hydrocolloid impression materials, would produce a die with acceptable surface qualities. The surface hardness and smoothness qualities of Vel-Mix, a commonly used die material, and Divestment were compared. Hardness comparisons were measured with the Rockwell superficial hardness tester. The results of the tests showed a mean Rockwell

hardness value for Divestment of 82, with a standard deviation of ±2.8; for the Vel-Mix, the mean hardness value was 86, with a standard deviation of ±3.3. Both figures exceeded the ADA recommended standard of 80 for improved stones. Smoothness was evaluated with a scanning electron microscope. Scanning electron photomicrographs were subjectively compared by six dentists. The results of the comparisons were inconclusive. It appears, therefore, that Divestment and Vel-Mix, when used with reversible hydrocolloid impression materials, will yield similar die surfaces with regard to hardness and smoothness.

No. 1

COMPARATIVE ACCURACY OF SINGLE-TAILED AND DOUBLE-TAILED REMOVABLE DIE SYSTEMS WITH AND WITHOUT PRECISION SLEEVES

J. T. Lockwood and M. W. Richards

Three recently developed removable die systems were evaluated for accuracy and stability under normal laboratory usage. Comparisons were made between these systems and the commonly used single-tailed brass dowel pin. For each die system, 10 standardized working casts were constructed for measuring accuracy. Measurements were made to within 0.0001 inch using a binocular crosshair measuring microscope. Each die was measured three times in the horizontal plane and once in the vertical plane before the casts were sectioned. The casts were sectioned, and the dies were removed and replaced 30 times to simulate laboratory conditions. Pre- and post-sectioning measurements were compared. The results showed that the mean horizontal, vertical, and rotational movement of dies was less for the two single-tailed systems than for either of the double-tailed systems. However, large variations were found in all samples and can most likely be traced to the possible errors that can occur with all removable die systems; namely, frictional wear and debris collection during removal and replacement of the dies. The large variations noted in this study suggest the need for dentists and dental technicians to exercise care in the utilization of any removable die system.

No. 2

A DETERMINATION OF ROOT CANAL SEALER BIOCOMPATIBILITY USING BOYDEN CHAMBERS

W. Doblecki

In vitro screening test results based on the cytotoxicity of the materials tested correlate poorly with the results of in vivo tests. Boyden Chambers can be used to determine the number of leukocytes responding to various test substances. A migration index based on this type of data would provide new information about the biocompatibility of dental materials. The purpose of this study was to evaluate the potential of six root canal sealers to enhance leukocyte migration. Leukocytes obtained from the peritoneal cavities of guinea pigs were labeled with ^{51}Cr. The leukocytes were 90% ± 3% (S.D.) polymorphonuclear leukocytes. Sodium caseinate was used as a positive control and Gey's medium was used as a negative control. Various dilutions of the supernatant fluids from freshly mixed sealers were used to challenge the ^{51}Cr-labeled leukocytes in blind well Boyden Chambers. The numbers of migrating leukocytes were compared using the control medium as a reference and separate sealer migration indices were calculated for each dilution of the supernatant fluids. The response to each root canal sealer was low, but apparently dose related. One of the sealers, AH-26, when tested as an undiluted solution, had an inhibitory effect. With further refinements of technique, Boyden Chambers may prove useful in the evaluation of the biocompatibility of dental materials.

No. 3

THE EFFECT OF SODIUM HYPOCHLORITE ON ANIMAL PERIAPICAL TISSUE

W. S. Hwang and R. L. Sherman

Sodium hypochlorite (NaClO) is probably one of the most popular irrigating solutions employed in endodontics today. Although NaClO is reported to be highly irritating to vital tissue, apparently no in vivo study has been reported showing its effect on periapical tissues. The purpose of this study was to evaluate the effects of NaClO in the periapical tissues of dogs. Forty-seven teeth in six mature beagle dogs were chemomechanically prepared. A 5% NaClO solution was used as the test irrigant and a normal saline solution as the control irrigant. Under aseptic conditions, the root canals were enlarged to a file size of 60 and to a distance of 1 mm short of the radiographic apex. Inflammatory responses were evaluated 1 to 3 days, 10 days, or 30 days after the teeth were prepared. After the animals were sacrificed, block sections of their maxillae and mandibles were removed, decalcified, embedded in paraffin, and serially sectioned at 7 microns. Inflammatory responses were graded as either none, mild, moderate, or severe, based on the presence and the intensity of the response. In those sections showing an inflammatory response, only polymorphonuclear leukocytes were seen. When the data for the three time periods were combined and statistically compared for presence or absence of inflammation, there was no significant difference between the saline control solution and the 5% NaClO solution.

No. 4

THE EFFECT OF VARYING FULCRUM LINES ON ABUTMENT MOVEMENT IN DISTAL EXTENSION REMOVABLE PARTIAL DENTURES

J. J. Simkovich and D. W. Anderson

Studies on abutment tooth movement dealing with distal extension removable partial dentures have been concerned primarily with fulcrum lines parallel to the occlusal plane and perpendicular to the sagittal plane. In the natural dentition, however, it is not always practical to make a bilaterally symmetrical denture. Consequently, a partial denture is often constructed with a fulcrum line not perpendicular to the sagittal plane or parallel to the occlusal plane. The purpose of this study was to determine the amount of abutment tooth movement in patients with distal extension removable partial dentures that are not bilaterally symmetrical. The study was undertaken using a test model and testing apparatus fabricated by the authors. Eight distal extension removable partial denture frameworks utilizing wrought wire, cast circumferential, and I-bar clasps were constructed and modified to vary the fulcrum lines during each measurement for abutment tooth movement. The removable partial frameworks were loaded left, right, and bilaterally. It was found that the direction of abutment tooth movement for bilateral and left

loads was the same because of nonsymmetrical extension base relief. Direction of abutment movement for right loads showed erratic measurements for all clasp systems in each modification. It was shown that cast circumferential clasps produced equal or greater abutment tooth movement than either wrought wire or I-bar clasps in all instances. Incisal rests produced equal or greater movement than gingival rests. No conclusion could be drawn pertaining to the increase or decrease in abutment tooth movement when the fulcrum line was made perpendicular to the sagittal plane and parallel to the occlusal plane.

No. 5

EVALUATION OF THE ANTIGENICITY OF FREEZE-DRIED SKIN ALLOGRAFTS IN HUMANS

M. E. Gher, Jr.

The use of free mucosal autografts for the correction of mucogingival problems has been a successful periodontal technique for several years. Recently, the use of freeze-dried skin allografts was shown to give similar results, with the additional advantage of decreased morbidity due to the elimination of the second surgical site for obtaining the graft material. However, if allogenic freeze-dried skin grafts stimulate the production of immunoglobulins in the graft recipient, then a future life-sustaining organ graft may be compromised. The purpose of this study was to evaluate the humoral antigenic potential of freeze-dried skin allografts in humans. Human tissue-typed skin was freeze-dried according to Navy Tissue Bank protocol. A total of 36 freeze-dried skin allografts involving 148 tooth sites were performed in 31 patients. Clinical measurements were taken prior to surgery and 8 weeks following surgery to document results. Blood samples obtained prior to the grafting procedure and 1, 2, 3, 5, and 8 weeks after grafting were analyzed for the production of anti human leukocyte (anti HLA) antibody using microcytotoxicity assay. Clinically, there was no evidence of graft rejection. The mean increase in the width of attached tissue was 3.80 mm following freeze-dried skin allografts. All serum samples were negative for the production of anti HLA antibody. Allogenic freeze-dried skin grafts used for the treatment of mucogingival problems in humans were nonantigenic when evaluated for anti HLA antibody, and they resulted in a significant increase in the width of attached tissue.

No. 6

EXAMINATION OF PATTERNS OF ALVEOLAR RIDGE RESORPTION OF THE DISTAL EXTENSION REMOVABLE PARTIAL DENTURE AND THEIR EFFECT ON THE MOBILITY OF THE PRIMARY ABUTMENT TEETH

J. R. Carney and M. J. Tabacco

The preservation and maintenance of the residual ridge beneath the distal extension removable partial denture is one of the most serious treatment problems we face. Several authors have attempted to relate RPD design and factors of clasp utilization, as well as anatomic and biologic influences, to abutment tooth mobility. The purpose of this study was to record the mobility of the abutment teeth of a mandibular bilateral distal extension RPD at different times and to observe other factors related to denture-base support. The one patient evaluated in this study required a mandibular Kennedy Class I RPD. Tooth mobility measurements were made utilizing a forcemeter and dial gauge assembly. Factors of ridge form, volume, and surface area were measured indirectly on diagnostic casts. Results for this patient showed only one significant increase in tooth mobility. This increase occurred in the distal direction of primary abutment tooth No. 21; however, the mobility returned to a baseline value at 6 months postinsertion. The lack of any significant change in tooth mobility of the two abutment teeth for this patient 1 year postinsertion is considered a favorable clinical response. No relationship could be found between ridge factors and abutment tooth mobility after 1 year.

No. 7

IN VITRO GROWTH OF HUMAN GINGIVAL FIBROBLASTS ON ROOT SURFACES OF ENDODONTICALLY OBTURATED TEETH

J. L. Gray and R. M. Dunlap

Controversy exists over the potential for new connective tissue attachment to dentin of endodontically obturated teeth following periodontal therapy. The purpose of this study was to determine whether cultured human gingival fibroblasts would grow in vitro on planed dentin surfaces of endodontically treated teeth. A model similar to that of Aleo et al. was developed using extracted endodontically treated human teeth. This model consisted of longitudinally sectioning 10 teeth, root planing one section only, and incubating both sections with a suspension of human gingival fibroblasts. Fibroblast growth was determined by staining with neutral red and trypan blue. The criterion for growth was staining of the complete root surface. All root areas with attached periodontal fibers, and also the complete root surface of all planed sections, displayed staining. Unplaned sections did not stain on root areas formerly exposed to the oral environment owing to periodontal disease, a finding consistent with the results of Aleo et al. Our results indicate

that root canal therapy does not interfere with in vitro growth of fibroblasts on planed dentin surfaces of endodontically treated teeth. Extrapolation to a clinical situation would indicate that normal healing may be expected following periodontal surgery on tissues adjacent to root planed endodontically treated teeth.

No. 8

STRESS AND THE ONSET OF ORAL DISEASE

M. T. Tyler

Evidence indicates that stress due to emotional problems is a major factor in precipitating attacks of oral disease. For this reason, the oral cavity has been called the target zone for the resolution of emotional stress. If a relationship could be found between stress and the onset of oral disease, future disease patterns in the military population could be predicted. The responses of 210 dental patients to the Holmes-Rahe Life-Change Unit Scale, the Brief Cornell Medical Index, the Manifest Anxiety Scale, and the Multiple Adjective Anxiety Checklist were evaluated in an effort to establish a relationship between stress and oral disease. Patients were randomly selected so that half of them had no lesions or history of lesions within the last year (control group). The other half had lesions or a history of lesions within the last year (experimental group). The mean scores compiled each of the four questionnaires were statistically cross-compared for differences between the two groups. The experimental group showed significantly greater daily anxiety than the control group, as measured by the Manifest Anxiety Scale and the Multiple Adjective Anxiety Checklist. Similar comparisons between the two groups on the basis of the Brief Cornell Medical Index, which measures emotional disturbance, and the Holmes-Rahe Life-Change Unit Scale, which measures change in an individual's life, showed no significance. A major factor in the onset of oral disease is emotional stress. An index of stress might be useful in predicting the distribution of future disease in a population.

No. 1

AN EVALUATION OF THE COLOR STABILITY OF A POLYMERIC MATERIAL FOR FACIAL PROSTHESES

J. J. Shanley

The intent of this study was to evaluate the color stability of a polymeric material (MDX 4-4210) with three specific white inorganic earth pigments (zinc oxide, zinc stearate, and titanium dioxide). The white pigments were chosen because they accounted for the major portion of the coloration in the fabrication of facial prostheses. Test samples of a pigment incorporated into MDX 4-4210 were exposed to ultraviolet light, corrosive compounds within the atmosphere, heat, and hygienic cleansing materials. Ultraviolet light absorbers were also evaluated as a protective mechanism against the discoloring influence of ultraviolet energy. Various shade formulas of the white pigments were exposed to natural sunlight and atmospheric conditions for a period of 4 months, accelerated ultraviolet energy in the form of a sunlamp for 24 hours, or dry heat at 60° C for a period of 24 hours. All samples were cleansed with a strong bacteriostatic cleansing agent. The samples were then compared to a set of controls to determine discoloration and degradation. The results indicated that the MDX 4-4210 maintained its color stability when exposed to natural and artificial ultraviolet energy, atmospheric contaminants, and hygienic cleansing agents. It was interesting to note that, when the MDX 4-4210 was exposed to the dry-heat test, a color change was observed. However, it is believed that antioxidants would eliminate this change. The ultraviolet light absorbers had no effect on the pigments. The best reproducibility was shown by zinc stearate, followed closely by zinc oxide. Titanium dioxide showed the poorest reproducibility.

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These abstracts provide a synopsis of research projects conducted by dental officers enrolled in the first-, second-, and third-year residency programs at the National Naval Dental Center, Bethesda, Maryland, during the academic year 1978-1979. The projects were completed in partial fulfillment of the requirements of the programs.

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